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This is Mendelian inheritance though somewhat complicated by the fact that every ontogeny has its beginnings in the preceding generation. Therefore, the conclusion which I recently expressed (Conklin 1916) *viz.* that polarity, symmetry and pattern of egg organization are non-Mendelian characters, is not justified.

Somewhat similar phenomena have been described by McCracken (1909); and Toyama (1913) in silk worms and by several authors (Locke, Castle, *et al*) in the seed characters of maize, wheat, etc. McCracken found that when two races of the silk worm are crossed one of which produces one brood a year (univoltin) and the other two (bivoltin), the F_1 offspring are all like their mother and in the F_2 generation "the broods fail to follow both parents in the expected proportions. Therefore," she concludes, "the Mendelian law does not hold in this case." Castle (1910) has criticised this conclusion and has explained these results on the ground that voltinism is inherited through the egg and that univoltinism is a Mendelian dominant to bivoltinism. Toyama (1913) has described in detail the mode of inheritance of several egg characters of silk worms and has shown that whereas these seem to be non-Mendelian they are in reality Mendelian, "the cause of disturbance of the proper order being due to the fact of maternal inheritance, in which paternal characteristics remain dormant, even though dominant in the egg stage."

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A CONTRIBUTION TO THE PETROGRAPHY OF THE ISLAND OF BAWÉAN, NETHERLANDS INDIES

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The mountainous island of Bawéan, between Java and Borneo, was formerly a group of volcanoes, now extinct and considerably eroded. It is about 9 miles in diameter, and the highest peaks are 2000 feet above the sea. The original form of the cones and craters has disappeared,

and sharp peaks with steep spurs and deep valleys, covered with tropical vegetation, constitute the dominant features of this picturesque and thickly populated island.

Verbeek, who with Fennema described Bawéan in their report on Java and Madura, noted the presence of leucitic and nephelitic lavas, together with trachytes, andesites and intermediate varieties. During a visit of four weeks in 1914 one of us collected rocks from numerous localities and studied the relations of the lavas to one another, so far as the covering of soil and vegetation would permit. Some of the specimens collected have been analyzed by Dr. Morley, and are the first rocks from Bawéan to be analyzed, so far as known to the writers.

The bulk of the lavas appear to be dark basaltic rocks with small phenocrysts of augite. They vary somewhat in habit, owing to the size and prominence of the phenocrysts and the denseness of the groundmass. They occur mostly as breccias, or tuffs containing blocks of various sizes, and to a less extent they are massive flows and dikes. They appear to constitute the body of the central mountains, and to be the older, or main mass of erupted material. With these basaltic rocks are associated lighter colored massive lavas, phonolites and trachytes, which form hills, spurs and ridges in all parts of the island. They appear to have been erupted from fissures, possibly from parasitic cones, on the flanks of the basaltic volcanoes, and probably were the latest eruptions in the district. However, no definite relations, or contacts, of the various bodies of lava were observed, the relative ages of the basaltic and phonolitic lavas being indicated by their modes of occurrence, which are like those of similar lavas in other volcanic districts in this part of the world.

Upon microscopical study it is found that the basaltic lavas are almost wholly leucite-bearing olivine-augite rocks with subordinate amounts of feldspar, both calcic plagioclase and alkalic feldspar, in part anthoclase, besides nephelite. These minerals vary in relative amounts in different lavas, and are variously developed according to the degree to which the rocks have been crystallized. In some instances the constituents of the groundmass are so minute as to be obscure and identifiable with difficulty. In such cases it is the alkalic feldspar and nephelite or leucite that is ill-defined. Judging by the better crystallized rocks, three of which have been analyzed chemically, analyses 1, 2, 3, the basaltic rocks are mostly vicioites, that is, leucite-nephelite-basalts with subordinate amounts of alkalicalcic feldspar and orthoclase. Some have more plagioclase and approach leucite-basanites or leucite-tephrites.

No rocks were collected which could be classed as andesites, nothing resembling the andesitic lavas so common on Java.

The rock, whose chemical composition is shown in analysis 1, is dark colored with abundant phenocrysts of augite, which are green in thin section, and with fewer of olivine. The groundmass is holocrystalline, and consists of leucite and prisms of plagioclase, partly inclosed in poikilitic orthoclase and nephelite. There is some magnetite. The mode is richer in leucite than the norm, and poorer in nephelite, owing to the presence of albite molecules in the lime-soda-feldspars. There is less orthoclase also in the mode than in the norm.

The rock, from which analysis 2 was made, is from the same locality as the first, but differs from it somewhat in habit, being more distinctly porphyritic, with phenocrysts of green augite which are markedly zonal in thin section. The groundmass consists of augites, small olivines, pronounced leucites, with less conspicuous prisms of plagioclase, and some magnetite. The ill-defined matrix probably contains orthoclase and nephelite. The mode of this rock is much richer in leucite than the norm, with other corresponding differences in the felsic constituents. These two rocks occur at the Falls of Grotjokan, near the center of the island.

The rock of analysis 3 occurs on the southwest coast of the island. It is light gray, with small, inconspicuous, phenocrysts of augite and scattered olivines. The holocrystalline groundmass consists of anhedral, poikilitic, lime-soda-feldspars, with microcline-like polysynthetic twinning, besides poikilitic orthoclase. Both kinds of feldspar inclose euhedral microlites of leucite and nephelite. This rock is more feldspathic than the vicinites just described, and its chemical analysis and norm show that it is transitional to the rock of analysis 1, and that it belongs in the magmatic division II. 7. 2. 3 of the Quantitative System of Classification. It is proposed to name this division, II. 7. 2. 3, *baweanose*, for, although the rock from Tandjung Anjer is transitional in composition, other varieties of lava will probably be found on Bawéan which will be still more salic, and will have a composition corresponding to the symbol II. 7. 2. 3.

The phonolitic lavas of the island belong to several varieties. Most of them are nephelite rocks with small phenocrysts of orthoclase and nephelite in a groundmass of alkalic feldspars, nephelite and pale green augite, with some sodalite; others, with similar phenocrysts, consist of minute euhedral nephelites, anhedral, micropertetic, alkalic feldspar, and clusters of poikilitic aegirite-augite with small prisms of what is

TABLE OF CHEMICAL ANALYSIS AND NORMS OF BAWÉAN LAVAS

	1	2	3	4	5	6
SiO ₂	45.85	45.81	47.76	55.89	55.25	53.58
Al ₂ O ₃	13.88	15.61	17.29	20.93	22.58	21.30
Fe ₂ O ₃	3.89	3.98	2.89	1.82	1.85	2.16
FeO.....	4.81	4.94	3.55	0.42	0.58	1.17
MgO.....	7.69	4.78	4.22	0.32	0.06	0.71
CaO.....	11.62	11.66	8.06	1.23	1.35	2.89
Na ₂ O.....	3.08	3.27	4.70	10.06	8.85	5.31
K ₂ O.....	4.32	4.31	6.77	6.18	7.29	4.74
H ₂ O+.....	0.64	0.35	0.97	0.87	0.82	3.56
H ₂ O-.....	0.50	0.40	0.76	0.26	0.08	2.34
TiO ₂	1.09	0.96	0.75	0.23	0.19	0.37
ZrO ₂	0.00	0.00	0.01	tr.	tr.	0.00
CO ₂	0.50	1.91	0.11	0.10	0.00	0.00
P ₂ O ₅	0.93	0.75	0.78	0.18	0.11	0.23
Cl.....	0.15	0.26	0.25	0.33	0.39	0.59
F.....	0.03	0.03	0.09	0.09	0.12	0.02
S.....	0.05	0.05	0.03	0.06	0.05	0.06
Cr ₂ O ₃	0.06	0.02	0.03	tr.	0.01	tr.
MnO.....	0.31	0.20	0.41	0.96	0.20	0.61
BaO.....	0.14	0.17	0.12	0.06	tr.	0.13
SrO.....	0.07	0.07	0.12	tr.	0.05	0.13
	99.61	99.53	99.67	99.99	99.83	99.90
<i>Norms</i>						
or.....	17.79	23.35	24.46	36.70	43.37	27.80
ab.....				20.96	18.86	40.35
an.....	11.12	15.01	6.12		.28	14.18
ne.....	14.20	15.05	21.58	28.12	30.39	2.27
lc.....	6.10	1.74	12.21			
C.....						2.35
ac.....				5.08		
ns.....				1.46		
di.....	32.85	30.34	23.10	4.77	0.22	
wo.....					2.20	
ol.....	5.60	1.39	2.36	0.44		1.87
mt.....	5.80	5.80	4.18		1.86	3.25
hm.....					0.64	
il.....	2.13	1.82	1.52	0.46	0.46	0.76
ap.....	2.02	2.02	2.02	0.34	0.34	0.34
etc.....	1.93	3.02	2.25	1.71	1.52	6.57
	99.54	99.54	99.80	100.04	100.14	99.74

1. Vicoite, shonkinose-cascadose, III. '7. 2. 3, Grotjokan Falls.
2. Vicoite, ourose-shonkinose, 'III. 6. 2(3). 3, Grotjokan Falls.
3. Vicoite, jancirose-baweanose, II (III). 7. (1)2. 3, Tandjung Anjer.
4. Tinguaitite, miaskose-laurdalose, (I)II. 6'. 1. '4. S. of Limpang Kopeng.
5. Tinguaitite, beemerose-miaskose, I. 6'. 1. (3)4, S. W. spur Gunung Besar.
6. Sodalite-trachyte, pulaskose-laurvikose, I'. 5. 2. (3)4, West side of Pulu Mepuri.

probably colorless pyroxene, possibly jadeite. This tinguatic phonolite forms fissile massive bodies, having a chemical composition shown by analyses 4 and 5; one from south of Limpang Kopeng in the east central part of the island, the other from a southwest spur of the central mountain, Gunung Besar.

Other phonolitic rocks have a trachytoid groundmass of prismoid alkalic feldspars with small leucites in some varieties, and minute en-hedral sodalites in others. Still fewer are trachytes with almost no recognizable feldspathoid constituent.

Analysis 6 is of a sodalite-trachyte which appears to contain some kaolinite, but the thin section does not show the presence of any hydrous mineral. The chlorine in the analysis corresponds to 8% of sodalite.

The rocks from Bawéan so far analyzed are strongly alkalic, with relatively high potash in the vicolites. They are chemically similar to the leucitic rocks of Mount Mourah in Java, and to the leucitic and nephelitic rocks of the Maros district in Celebes, but they differ in petrographical characters from the rocks of both these districts.

THE PHYLOGENETIC DEVELOPMENT OF SUBAPTEROUS AND APTEROUS CASTES IN THE FORMICIDAE

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It is generally admitted that each of the four groups of social insects—the social bees, social wasps, ants and termites—has had an independent phyletic origin and history and that the similarities in their habits are due to parallelism, or convergence, of which, indeed, they exhibit striking examples. In both the fertile and sterile females of social wasps and bees the wings show no signs of reduction, whereas these appendages are well-developed in the fertile females (females proper) of the great majority of ants, at least prior to fecundation, but are normally always absent in the sterile females, or workers. Paleontology proves that identical conditions have long existed in the Formicidae as a family, since they are clearly shown in the abundant and beautifully preserved ants of the Baltic amber from the Lower Oligocene Tertiary.¹

Writers also agree that the ants must be descended from certain